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I, JULIE BILLINGSLEY, TEAM LEADER EXAMINATION SUPPORT AND SALES hereby certify that annexed is a true copy of the Provisional specification in connection with Application No. 2002950438 for a patent by UHS SYSTEMS PTY LTD as filed on 29 July 2002.

WITNESS my hand this
Twenty-eighth day of July 2003

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Technical field

This invention relates to telemetry systems and will be described in the context of security systems such as burglar alarm systems. In particular, the invention provides a system which can be interposed between existing
5 installed telemetry equipment such as alarm panels and their associated monitoring centres.

Background art

The challenge for remotely monitored alarm systems has always been to ensure that the automatic alarm announcement resulting from an alarm
10 condition is correctly received at the monitoring site, being a security company or the like, or in some instances, the alarm can be announced to local security authorities such as the police.

At their most basic form, burglar alarm systems provide an automatic telephone calling system over the normal wired telephone land line service to
15 announce alarm conditions at a monitored site.

This system has a number of inherent disadvantages in that,

- 1) A burglar can cut the land line and subsequently deactivate the alarm system and thereby gain entry to premises without being detected
- 2) Faults in the telephone network may prevent the announcement from
20 being received at the monitoring site
- 3) At the time the burglar alarm system uses the telephone land line to make an automated announcement the telephone land line is not available for others to make, say an emergency telephone call
- 4) As burglar alarm systems can not be uniquely identified by their own
25 address (see US Patent 6,381,307 Sur-Gard Security Systems Ltd) it is a simple matter to have an unauthorised burglar system masquerading as the authorised one thereby defeating the security system

In another known system (see US Patent number 5,131,019, VerSuS Technology, Inc.), it has been proposed to additionally provide a cellular

telephone or like radio communication device which can be activated to announce a burglar entry to the premises protected by the alarm if the telephone land line is cut.

This system has a number of inherent disadvantages in that,

- 5 1) Faults in the telephone network may prevent the announcement from being received at the monitoring site
- 2) An announcement is only sent to the monitoring site infrequently allowing the system to be disabled unbeknown to the security company, for example by a disgruntled employee
- 10 3) As burglar alarm systems can not be uniquely identified by their own address (see US Patent 6,381,307 Sur-Gard Security Systems Ltd) it is a simple matter to have an unauthorised burglar system masquerading as the authorised one thereby defeating the security system

15 In another known system (derived channel monitoring system, see US Patent 4,442,320, Base Ten Systems, Inc.), it has been proposed to monitor the remote alarm system and the telephone land line from the telephone company's local exchange using specialised equipment installed and operated by the telephone company that directs alarm announcements to security companies or the like, or in some instances, to local security
20 authorities such as the police. This system thus has a need for third party equipment in the network which is necessary to collate the alarm information for retransmission to the monitor station.

25 Such an Alarm Monitoring System is shown in Figure 1 and comprises specialised alarm equipment at the remote site or customer premises, alarm scanning equipment at the local telephone exchange, central station equipment located at one of the telephone company's offices and specialised equipment at the security company. One implementation of this type of system is given below,

- 30 1) The burglar alarm system or associated equipment is connected to the telephone land line and generates a low frequency out of band signal (low tone) that is received at the telephone company's local exchange

2) The Alarm Scanning Equipment located at the telephone company's local exchange regularly polls the burglar alarm system or associated equipment with voice frequency modem signals over the telephone land line

5 3) The absence of low frequency signal (low tone) from the burglar alarm system or associated equipment results in the alarm scanning equipment located at the telephone company's local exchange sending a poll request to the burglar alarm system or associated equipment

10 4) The burglar alarm system or associated equipment responds to the poll from the alarm scanning equipment located at the telephone company's local exchange by sending as part of the poll response message the identification of the outstanding alarms. The message is forwarded to the telephone company's Central Station equipment where it is converted into an alarm announcement message which is
15 sent to the security company over the telephone company's data network.

20 5) In the event that the alarm Scanning equipment located at the telephone company's local exchange does not get a response to a predetermined number of poll request messages, it informs the Central Station equipment which generates an alarm announcement message indicating that the monitored site is no longer being monitored. This message is sent to the security company over the telephone company's data network.

This system has a number of inherent disadvantages in that,

25 1) It can only be used where the telephone company has deployed the Central Station equipment and then only from specific telephone exchanges where connection to the Alarm Scanning equipment is available

30 2) Redundant paths from the burglar alarm system are not supported. A failure of the Alarm Monitoring system prevents the burglar alarm system from sending any announcements to the security company.

- 3) The polling process uses voice frequency signalling that interferes with the use of data modems and faxes on the telephone land line
- 4) The low frequency out of band signal (low tone) generated by the burglar alarm system or associated equipment is incompatible with telecommunications equipment commonly used in the customer access network (last mile), further limiting the application of this technology
- 5) The signals transmitted on the analogue link may be encrypted, although in practice any such encryption may be detected and broken over relatively short time scales. Once the code has been broken, then an attack may be made by cutting into the line and substituting a dummy terminal which masquerades as the real terminal. This makes it possible to disable the security system at the customer premises without the monitoring service being alerted.
- 6) The burglar alarm system or associated equipment used for this system implement proprietary signalling and are therefore more expensive than standard burglar alarm systems that provide an automatic telephone calling system over the normal wired telephone land line service to announce alarm conditions at a monitored site.
- 7) This system and other similar digital embodiments require the use of intermediate equipment (Central Station in Figure 1) often controlled by a third party for example the telephone company which manipulates and relays the alarm messages to the security company
- 8) In this system the alarm equipment sends an announcement only when polled by the intermediate equipment (Central Station in Figure 1)
- 9) The message transfer time of this system is determined by the polling rate set by Alarm Scanning equipment

In another known system (ISDN monitoring system, US Patent 6,377,589, British Telecommunications public limited company), it has been proposed to monitor the alarm system and the telephone land line from the telephone company's local exchange by providing the telephone service over an ISDN basic rate access system over the land line.

Such a system is shown in Figure 2 and comprises specialised alarm equipment at the remote site or customer premises, ISDN Terminal Adaptor equipment, ISDN NT1 equipment, Central Station equipment located at one of the telephone company's offices and specialised equipment at the security company. One implementation of this type of system is given below,

- 1) The Central Station equipment located at one of the telephone company's offices sends regular poll request messages to the burglar alarm system or associated equipment over the ISDN 'D' channel
- 2) The burglar alarm system or associated equipment responds to the poll request messages over the ISDN 'D' channel and in the same message sends any pending alarm announcements to the Central Station
- 3) The Central Station forwards the alarm announcements to the security company over the telephone company's data network
- 4) Redundancy is supported over the GSM network with SMS (Short Message Service) text messages

This system has a number of inherent disadvantages in that,

- 1) It can only be used where the telephone company has deployed the Central Station equipment
- 2) SMS text messages do not have guaranteed delivery times and do not represent a reliable form of back-up. (Fire alarms are required to report within 15 seconds).
- 3) The burglar alarm system or associated equipment used for this system implement proprietary signalling and are therefore more expensive than standard burglar alarm systems that provide an automatic telephone calling system over the normal wired telephone land line service to announce alarm conditions at a monitored site
- 4) To use this system the users must replace their existing telephone system with an ISDN based system potentially incurring significant cost and the inconvenience of having a new telephone number assigned

- 5) This system and other similar digital embodiments require the use of intermediate equipment (Central Station in Figure 2) often controlled by a third party for example the telephone company which manipulates and relays the alarm messages to the security company
- 5 6) In this system the alarm equipment sends an announcement only when polled by the intermediate equipment (Central Station in Figure 2)
- 7) The message transfer time of this system is determined by the polling rate, furthermore, multiple poll periods are required to identify a line break making this system unsuitable in some critical applications where
10 the line break condition needs to be rapidly identified

The recent introduction of ADSL systems for broadband access has created a problem for burglar alarm systems that provide an automatic telephone calling system over the normal wired telephone land line service to announce alarm conditions at a monitored site. The modem used to terminate
15 the ADSL service at the customer premises generates high frequency voltage signals that interfere with the operation of the automatic telephone calling system of the aforementioned burglar alarm systems, necessitating the installation of specialised signal filters by specialist technicians to eliminate the interference.

20 It is therefore an object of the present invention to attempt to overcome one or more of the aforementioned problems.

In particular, it is advantageous to provide a system which can be interposed between existing alarm and monitor systems.

Summary Of The Invention

25 According to a first embodiment of the invention there is provided a system and method including:-

one or more supervision terminals;

one or more remote terminals associated with at least one of the supervision terminals;

a data network linking the supervision terminal and the remote terminal;

wherein;

the or each supervision terminal is in communication with each corresponding associated remote terminal across the data network without the intervention of
5 an intermediate agency.

Accordingly, this system can be interposed by the alarm system operator between existing installed alarm panels at customer premises and the system monitors at the system operators premises without the need for the installation of additional intermediate equipment in the
10 telecommunications network.

According to a second embodiment, the or each remote terminal communicates with its associated supervision terminal or terminals using a predetermined communication protocol.

Preferably, the communication protocol used is the TCP/IP protocol
15 suite.

In a further embodiment, the data network is a broadband network.

Preferably, the remote terminal is linked to the network via an ADSL link.

Alternatively or in addition, the remote terminal is linked to the network
20 via a wireless link

Preferably, the wireless link is a cellular network link.

In a preferred arrangement, the wireless link is a GPRS link.

In a further embodiment, the supervision terminal is adapted to transmit poll requests to the or each remote terminal, and the or each remote terminal
25 is adapted to transmit a poll response to the supervision terminal on reception of a poll request.

In a further refinement, the supervision terminal transmits poll requests at a poll request repetition rate, and wherein, when no poll response is

received from the remote terminal within a first window period in response to a poll request, the supervision terminal transmits repeat poll requests after the first window period, the first window period being less than the poll request repetition period. Missing poll responses generates alarms to the monitor
5 system

Optionally, the request poll includes selectable data, and the remote terminal includes response selection means to select a related response message from the selectable information in the poll request. To ensure security, the supervision terminal includes verification means to verify the
10 related response message from the remote terminal. The supervision terminal uses the poll response from the remote terminal to verify integrity of the path between the remote terminal and the supervision terminal.

Preferably, the remote terminal is adapted to transmit alarm messages independently of the reception of a polling request from a supervision
15 terminal.

In another modification, the remote terminal is adapted to transmit heartbeats to the or each associated supervision terminal. The remote terminal may transmit heartbeats to the or each associated supervision terminal autonomously or as a response to a poll request from an associated
20 supervision terminal.

In a further modification, the remote terminal includes a bypass switch; and remote terminal monitor means monitoring the remote terminal, the remote terminal monitor means being adapted to operate the bypass switch to disconnect the remote terminal and to connect the alarm terminal to a
25 telephone network in the event of a failure of the remote terminal.

Preferably, the remote terminal includes a telemetry interface adapted to emulate a network interface for the corresponding telemetry equipment and to convert information received from the telemetry equipment to the network communication protocol.

30 In an embodiment of the system, the supervision terminal is connected

to an associated monitor system, which makes information received from the supervision terminal available to an operator.

5 The supervision terminal preferably includes monitor interface emulation means converting information from the supervision terminal to the monitor information format.

10 The supervision terminal preferably includes supervision terminal self-diagnostic means and sends supervision terminal status reports to the associated monitoring system. Similarly, the remote terminal includes remote terminal self-diagnostic means and sends remote terminal status reports to the associated monitoring system.

To facilitate the process of associating remote terminals to supervision terminals, an association register recording the association between remote terminals and supervision terminals may be provided.

15 An additional supervision terminal may be provided for each system to provide redundancy.

The association register may be located in a registration server, and the address of the registration server installed in remote terminals to enable the remote terminals to communicate with the registration server whenever the remote terminal is powered up.

20 Preferably, the remote terminal includes a telemetry interface and the telemetry interface emulates a network interface for the corresponding telemetry equipment, converts information received from the telemetry equipment to the network communication protocol, and transmits the converted information to the supervision terminal.

25 The invention also encompasses a supervision terminal for use in the system, and a remote terminal for use in the system.

The present invention provides a monitoring system which offers improved security and greater flexibility in operation combined with low transmission overheads. This is achieved by utilising the broadband IP

network between a plurality of Customer Terminals and a plurality of Agency Terminals, polling the Customer Terminals from the Agency Terminals on the broadband network and using the poll response messages to uniquely identify the Customer Terminals. The use of IP messaging makes possible the
5 application unique code sequences significantly increasing security and reducing the likelihood of unauthorised Customer Terminal unit substitution.

Preferably links to the broadband network from the Customer Terminal are over cable-modem, LMDS, cellular telephone system such as GPRS or 1xRTT, DSL technology particularly ADSL, Frame Relay or ATM links utilising
10 point to point radio (such as microwave systems) or fibre-optic systems.

Preferably links to the broadband network from the Agency Terminal are over cable-modem, LMDS, cellular telephone system such as GPRS or 1xRTT, DSL technology, Frame Relay or ATM links utilising point to point radio (such as microwave systems) or fibre-optic systems.

15 A further advantage of the present invention is that it is suitable for implementation using standard broadband access technology such as ADSL operating on the existing telephone link. The monitoring function can then operate transparently, without interfering with the operation of the telephone line. The telephone line is therefore available for simultaneous use, for
20 example, for voice telephony.

Preferably the Agency Terminals transmit the poll messages in one segment and the Customer Terminals return to the Agency Terminal a single poll response message also in one segment.

25 Preferably each polling request from the Agency Terminal includes an unencrypted random numerical value as well as information uniquely identifying the Agency Terminal and the Customer Terminal the poll is destined for. The poll response includes an unencrypted numerical value generated from a function agreed on at system initialisation used to uniquely identify the Customer Terminal.

30 The present invention is not limited in applicability to systems in which the remote terminal is a burglar alarm, although the high degree of security

offered by the invention is particularly advantageous in this context. Other uses for the invention include remote monitoring of meters, for example electricity, gas or water meters, or remote monitoring of the status of an automatic vending machine.

- 5 In the description and claims the term 'alert condition' covers both alarm events and poll response failures.

Brief Description Of The Drawings

The invention will now be described with reference to the embodiments shown in the accompanying drawings, in which:-

- 10 Figure 1 shows the typical implementation of derived channel security systems that use low frequency tones generated by the customer premises equipment to provide line monitoring;

- 15 Figure 2 shows a security network implemented over ISDN Basic rate transmission system, where the customer's burglar alarm equipment is polled over the ISDN 'D' channel;

Figure 3 is a schematic of the system embodying the present invention;

Figure 4 is a detailed schematic of an embodiment of equipment for implementing the Customer Terminal of the system of Figure 3;

- 20 Figure 5 is a schematic providing additional details as to the implementation of the Customer Terminal given in Figure 4;

Figure 6 is a detailed schematic of an embodiment of the Agency Terminal interconnection to the broadband network and the Automation System;

Figure 7 is a schematic of an embodiment of the Agency Terminal;

- 25 Figure 8 is a schematic of an embodiment of the Automation System;

Figure 9 is a schematic of an embodiment of the Registration Server;

Figure 10 is an exemplary message flow diagram illustrating the

operation of the system under different operating scenarios including polling, transporting of alarms messages and the loss of poll response messages;

Figure 11 is an exemplary message flow diagram illustrating the operation of the system during Customer Terminal and Agency Terminal start up scenarios;

Figure 12 shows the protocol stacks that may be used in ADSL based systems embodying the invention;

Figure 13 show the protocol stacks used in the wireless IP based systems (for example GPRS or 1xRTT) embodying the invention;

Figure 14 shows the preferred poll and poll response message formats used in the preferred embodiment;

Figure 15 shows the preferred format of the alarm notification messages from the Customer Terminal to the Agency Terminal and the format of the acknowledge message from the Agency Terminal to the Customer Terminal used in the preferred embodiment;

DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS

Figure 3 shows a communications system including a broadband network (35), Customer Terminals (33), Burglar Alarm equipment (31), Agency Terminals (37, 38), Automation Systems (310) and Registration Servers (312).

Customer Terminals (33) are generally located at customer sites and are generally connected using the Voice Frequency interface (32) to the telephone land line connection of one or more Burglar Alarm systems (31), as for example in a residential apartment building. Other forms of connection (32) between the Customer Terminal (33) to Burglar Alarm systems (31) are possible, including Serial Interfaces, generally covered by RS.232 and RS.485, local area network, such as Ethernet and the use of individual control lines for input and output. In the prior art, Burglar Alarm systems (31) use the telephone land line connection to automatically announce to a remote monitoring centre such as a security company the triggering of one or more

detectors that are used to indicate an alarm condition. The alarm condition is converted to VF using an industry standard format signal for transmission over the telephone land line.

Each Customer Terminal (33) is connected to the broadband network using one or more broadband connections (34), including but not limited to (HFC) coaxial cable, copper cable (two wire and/or four wire), optical fibre, cellular telephony or wireless. Multiple connections to the broadband network may be used to provide redundancy and path diversity. These connections provide an always-on virtual path between the Customer Terminals (33) and Agency Terminals (37). In addition, they are capable of operating in parallel with the telephone land line.

One or more Customer Terminals (33) are generally associated with one or more Agency Terminals (37) so that in the simplest configuration one Agency Terminal (37) monitors one Customer Terminal (33). For greater reliability, two or more Agency Terminals (37, 38) operating in N+1 redundancy mode may be used to monitor one Customer Terminal. Generally, two or more Agency Terminals (37) operating in N+1 redundancy mode are used to monitor one or more Customer Terminals (33). The Registration Server (312) is one of the means used by the preferred embodiment to carry out the association of Customer Terminals (33) to Agency Terminals (37). In this manner the broadband network may support one or more independent communications networks.

The Agency Terminals (37) are generally located on site at the security monitoring company. As this communications network can be used for purposes other than security, such as telemetry, health monitoring and so on, the Agency Terminal (37) may reside in the premises of the organisation carrying out the remote monitoring, or remotely accessed through an interface to the Agency Terminal (37).

In the preferred embodiment the alarm or event messages generated by the Burglar Alarm system (31) that are automatically announced on the Voice Frequency interface (32) using an industry standard format are intercepted by the Customer Terminal (33), which decodes the

announcement, converting it into a message format suitable for transmission over the broadband network (35). In the preferred embodiment the messages are sent over the broadband network using the known Internet Protocol (IP) using the known UDP (User Datagram protocol) transport protocol, alternative
5 embodiments using TCP as the transport protocol are also possible. The encapsulated alarm or event messages are sent by the Customer Terminal (33) to the associated Agency Terminals (37) over the one or more broadband connections (34) available to said Customer Terminal (33).

Customer Terminals (33) generally monitor the Burglar Alarm system
10 (31) they are connected to using a range of means, including by generating test alarm signals and intercepting the automated alarm announcement generated by the Burglar Alarm system (31) in response to the test signal. Customer Terminals (33) report the failure of any test sequence or any other exception to their associated Agency Terminals (37) by sending out copies of
15 the announcement message over one or more broadband connections (34) available to said Customer Terminal (33).

Agency Terminals (37) connect into the broadband network (36) through one of a number of possible connection means, including but not limited to wireless, copper cable, optical fibre and coaxial cable. A connection
20 over a local area network is also possible, allowing other broadband traffic to share the connection.

Agency Terminals (37) are generally, but not exclusively deployed in an N+1 redundant configuration, where $N \geq 1$. Redundant operation is achieved through the broadband network, although local interconnectivity
25 between Agency Terminals (37) using a local area network connection between the Agency Terminals (37) is also supported (Figure 6 reference (66)).

The Agency Terminals (37) send poll request messages to their associated Customer Terminals (33) over the broadband network (Figure 10
30 and Figure 14). The Customer Terminals (33) send poll response messages in response to each poll request message. In the event that the Customer Terminal (33) has not responded to a predetermined number of poll requests

from the Agency Terminal (37) in a specified time interval, the polling Agency Terminal (37) notifies the Automation System (310) over a data connection including serial RS.232 link and a local area network connection (39).

5 As Customer Terminals (33) may be equipped with one or more connections into the broadband network (35) over which the polling is conducted, the severity of the loss of poll responses from a particular Customer Terminal (33) depends on the number of broadband connections (34) available to said Customer Terminal (33).

10 Agency Terminals (37) poll their associated Customer Terminals (33) over the broadband network (35). Each poll (Figure 14) includes an unencrypted identifier as well as information uniquely identifying the sending Agency Terminal (37) and the destination Customer Terminal (33). The poll response from the Customer Terminal (33) includes an unencrypted identifier determined by a method programmed into the Network Processor (Figure 4
15 reference (45)) of the Customer Terminal (33). The Agency Terminal (37) implements a complementary method to ensure that each poll response identifier matches the poll request identifier. The method used at the Customer Terminal (33) and the Agency Terminal (37) to generate the identifiers is agreed on as part of the Customer Terminal's (33) registration
20 process (Figure 11 reference (113)).

On start up, each Agency Terminal (37) registers with the one or more Registration Servers (312) configured to provide N+1 redundancy by sending the Registration Servers (312) (Figures 9 and 11) its IP address and a range of customer Burglar Alarm (31) system identifiers. The Customer Terminals
25 (33) are manufactured with the hard-coded World-Wide-Web address of the Registration Servers (312). On start up and following service restoration after equipment, network (34, 35, 36) or Agency Terminal (37) outage the Customer Terminals (33) access the Registration Servers (312) to identify their associated Agency Terminals (37).

30 When registering, eg, on initial installation or on reboot, Customer Terminals (33) provide the Registration Server (312) their IP address, their unique hardware identifier, and information obtained from the Burglar Alarm

(31), such as security company telephone number and security account number which are obtained from the Burglar Alarm system's dial up information intercepted by the Customer Terminal (33). The Registration Server (312) uses this information to determine the destination Agency Terminals (37), and sends the IP addresses of the associated Agency Terminals (37) to the registering Customer Terminal (33) for use in sending alarm messages to the associated Agency Terminals (37).

The Registration Server (312) and Agency Terminals (37) implement methods that reduce the likelihood of unauthorised units masquerading as valid Customer Terminals (33) or Agency Terminals (37).

Alternative embodiments that avoid the need for the Registration Server (312) through the use of IP VPNs are possible. In one alternative embodiment, the message route is set up as part of the customer account configuration by the Telephone Company or Internet Service Provider, so that messages from Customer Terminals (33) are routed by the network to the associated Agency Terminals (37) eliminating the need for a Registration Server (312).

During normal operation, event and alarm messages generated by Burglar Alarm equipment (31) are sent by the Customer Terminals (33) over the broadband network (35) to their associated Agency Terminals (37). The Agency Terminals (37) implement message synchronisation schemes that ensure that only one message is sent on to the Automation System (310) (Figure 10 reference (102)).

The number of Agency Terminals (37) and Customer Terminals (33) shown in Figure 3 are for the purposes of illustration only, in practice the number of terminals that may be linked to the communications network are limited only by the range of IP addresses available.

Agency Terminals (37) also send configuration and other messages to Customer Terminals (33) including software down-load (Figure 15).

Figure 4 provides further detail of the components making up the preferred embodiment of the Customer Terminal supporting both ADSL (48)

and wireless (49) connections into the broadband network. The Burglar Alarm Equipment (41) may be security industry standard equipment, generally available with a digital dialler and using various security industry voice frequency telephony formats to transmit automated announcements. The Alarm Panel Interface block (43) is programmable to receive and decode messages generated by the Burglar Alarm Equipment (41) and is capable of interpreting/decoding messages of different formats. The decoded messages from the Burglar Alarm Equipment (41) are forwarded to the Network Processor block (45) for encoding, addressing and dispatch. The Alarm Panel Interface block (43) is also used for testing the Burglar Alarm Equipment (41), and reporting any irregularities such as equipment fault, equipment missing or unauthorised reprogramming.

The Line Interface block (44) connects the Customer Terminal to the telephone land line (411) used to convey the ADSL signal and contains the switching circuitry (Figure 5) used to bypass the Alarm Panel Interface block (43) and to provide the Burglar Alarm Equipment (41) with direct connection to the telephone land line (411) to be used to transmit automated announcements to the security company and the like in the event of a Customer Terminal failure.

In an ADSL implementation shown in Figure 4, the POTS Splitter block (46) is used to separate out the high frequency ADSL signals from the low frequency POTS signals carried on the telephone land line (411). The low frequency POTS signal is conveyed to the in-premises telephone line (412) and the high frequency signals are conveyed to the ADSL modem block (48).

The ADSL Modem block (48) terminates the ATM cells used to carry the broadband IP data to/from the broadband network, and to forward the IP data to the Network Processor block (45). The Network Processor block (45) examines the data for messages from the associated Agency Terminals, such as poll, control, configuration and acknowledgment messages, which are terminated (see also Figure 10). Other messages carried on the broadband connection to the Customer Terminal such as messages used when 'surfing' the Internet are passed on to the Ethernet block (47) by the Network

Processor block (45). The Network Processor block (45) also ensures that messages from the Ethernet block (47) destined to the broadband network are not addressed to any of the associated Agency Terminals.

5 Event and alarm messages received by the Alarm Panel Interface block (43) are converted in the Network Processor block (45) into the known IP message format suitable for transmission over a broadband network. The messages are sent out simultaneously over the ADSL (48) block and the Wireless (49) IP block, preferably implemented over a cellular network such as GSM (GPRS) or CDMA (1xRTT), to the associated Agency Terminals. The
10 Agency Terminals send acknowledgment messages to the Customer Terminal indicating that the alarm message has been received (see also Figure 10).

15 The Network Processor block (45) identifies conditions local to the Customer Terminal that need to be reported to the Agency Terminals. The Network Processor block (45) generates messages corresponding to these conditions using the known IP message format suitable for transmission over a broadband network. The messages are sent out simultaneously over the ADSL (48) block and the Wireless (49) IP block, preferably implemented over a cellular network such as GSM (GPRS) or CDMA (1xRTT), to the associated
20 Agency Terminals. The Agency Terminals send an acknowledgment message to the Customer Terminal indicating that the alarm message has been received (see also Figure 10).

The Power (410) block is used to power the Customer Terminal and charge a battery for the provision of power in the event of AC mains failure.

25 In the preferred embodiment, the Customer Terminal may operate using an ADSL connection, using the in-built ADSL Modem (48) or using a wireless IP connection with the in-built Wireless Modem (49) which supports connection into the broadband network in places where land line connection is not supported. For improved reliability Customer Terminals may operate using
30 both an ADSL connection, using the in-built ADSL Modem (48) and using a wireless IP connection with the in-built Wireless Modem (49).

Figure 5 details implementation of the voice frequency interface for the ADSL embodiment which includes the ADSL and wireless mode of operation. The telephone land (51) line used to convey the ADSL and POTS signal enters the Customer Terminal unit through an ADSL low pass filter (52). The high frequency components are directed to an ADSL modem block (53). The low frequency components pass through a normally energised relay (55), shown in the unenergised state, and exit to the in-premises telephone cabling (59). During normal operation, the telephone land line interface (58) of the Burglar Alarm Equipment is connected to the Customer Terminal's VF Port (54) through a normally energised relay (56) shown in the unenergised state. In the event of the Customer Terminal failing, or losing power, relays (55), (56) and (57) assume the states shown in Figure 5, providing the Burglar Alarm Equipment with a direct connection to the telephone land line (58 to 51). Table 1 shows the active terminals for the relays in the powered state and in the power loss state.

TABLE 1 – Relay Operation		
RELAY	Active Terminal Powered	Active Terminal Power Loss
55	2	1
56	2	1
57	2	1

Figure 6 details the preferred embodiment of the Agency Terminal interfaces. In the preferred embodiment, at least two collocated Agency Terminals (64) are used operating in 1+1 redundancy, each connected to the broadband network, one using an ADSL connection with a copper line (61) and an ADSL modem (63) and the other using a point to point microwave connection (62) providing both redundancy and path diversity. Optionally, the Agency Terminals (64) are connected to a local area network used for

communications between Agency Terminals (64) for purposes such as process monitoring and database synchronisation. Alternative embodiments using different means of connecting to the broadband network are possible.

Agency Terminals (64) poll their associated Customer Terminals, the
5 polling process is coordinated to ensure that only one Agency Terminal (64) polls all the Customer Terminals that are associated with the security company or the like. The non-polling Agency Terminals (64) monitor the polling Agency Terminal (64) by internal messages over their mutual local area network (66) or broadband connection. When the polling Agency
10 Terminal (64) is found to be faulty, another associated Agency Terminal (64) takes over the polling task. Alternative embodiments are possible using dynamic load sharing between the Agency Terminals (64) in the N+1 redundancy group so that all Agency Terminals (64) in the group are involved in the polling process.

15 Event and alarm messages are sent by Customer Terminals to each associated Agency Terminal (64) over the broadband network connection (62, 63) for forwarding to the Automation System (67) (see also Figure 8) for display to the security company operators. The Agency Terminals (64) maintain process synchronisation to ensure that event and alarm messages
20 are only sent once to the Automation System (67) over the interface (65) which may include a number of options, including a serial link or a local area network. Agency Terminal (64) messages to the Automation System (67) that are not acknowledged by the Automation System (67), are re-sent by another Agency Terminal (64) after a predefined time interval has elapsed.

25 The message formats used on the connection (65) between the Agency Terminals (64) and the Automation System (67) are similar to those used on the connection (610) between the prior art Dialler Receiver (69) and the prior art Automation System (67), which facilitates the fall-back operation mode of the system as described above whereby in the event of a malfunction
30 of a Customer Terminal the Burglar Alarm Equipment is provided with a direct connection to the telephone land line and uses dial-up means through the public switched telephone network (68) to send alarm announcement to the

Dialler Receiver (69) used to provide the back-up means and thereby to the Automation System (67).

Figure 7 is a schematic of the preferred embodiment of the Agency Terminal implemented by means of software executing on commercially available computer equipment. In the preferred embodiment the database maintains the broadband IP addresses of all associated Customer Terminals. The PollThread (71) is used to trigger the polling of the Customer Terminals and implements the method for generating the poll request message identifier and verifying the poll response message identifier. The Agency Terminal also implements the method for decoding the alarm messages, converting the messages sent by the Customer Terminal over the broadband network into a format suitable for interfacing to the prior art Automation System. The database also provides the means for synchronisation between the two or more Agency Terminals operating in N+1 redundancy.

Figure 8 shows a possible embodiment of a known Automation System suitable for use in a system embodying the present invention. The Automation System maintains records in its database of the active customers of the security company and the like and the alarm messages and their subsequent action for each customer. When an alarm message is received by the Automation System it displays the meaning of the message and the identity of the affected customer on a suitable display means, and provides the operator with means to determine the action to take, as agreed upon with the customer.

Figure 9 shows the preferred embodiment of the Registration Server, implemented as a software program executing on standard commercial computer equipment. The Registration Server may be connected to the broadband network using redundant means such as ADSL and wireless. It maintains records in its database of all active Agency Terminals and their identification codes and IP addresses. The Registration Server also maintains records in its database of all Customer Terminals and their identification codes and IP addresses. In addition, the Registration Server implements a method that allows it to identify Customer Terminals and Agency Terminals as

authorised or unauthorised based on their identification codes. Authorised Agency Terminals are registered with the Registration Server, whereas unauthorised Agency Terminals are reported to the network supervision group as agreed by the relevant industry association. Authorised Customer

5 Terminals are registered by the Registration Server and are provided with the IP addresses of their associated Agency Terminals, while unauthorised Customer Terminals are rejected and their registration attempt reported to the network supervision group.

As noted above, alternative embodiments that use IP VPNs are

10 possible that avoid the need for the Registration Server.

Figure 10 is a message flow diagram used in the preferred embodiment.

The process used by Agency Terminals to poll their associated Customer Terminals is illustrated by Figure 10 (101) showing the message

15 being sent out from the Agency Terminal (Figure 7 functional block (71)) to the Customer Terminal (Figure 4 functional block (45)) and the response from the Customer Terminal (Figure 4 functional block (45)) to the Agency Terminal (Figure 7 functional block (72)).

The messages associated with the delivery of an announcement

20 message from the Burglar Alarm system through the communication system to the Automation System are illustrated by Figure 10 (102). The event announcement is sent by the Burglar Alarm system to the Customer Terminal (Figure 4 functional blocks (41) and (43)). The Customer Terminal re-formats the message for transmission over the broadband network using UDP packets

25 over IP (Figure 4 functional block (45)) and forwards it to its associated Agency Terminals (74). The Agency Terminals (74) verify the source of the alarm message using the unique identifying information carried in the message and store the decoded alarm messages in their database (77), re-code the messages into the Automation System protocol and forward the

30 messages to the Automation System (Figure 7 functional blocks (74), (75) and (73)). Simultaneously, the Agency Terminals (74) return acknowledgment messages to the Customer Terminal (Figure 4 functional block (45)). The

Customer Terminal then acknowledges the alarm message to the Burglar Alarm system (Figure 4 functional block (43)). The Automation System (Figure 8) acknowledges the reception of the alarm message to the specific Agency Terminal that had sent the message to the Automation System. The Agency
 5 Terminal stores the acknowledgment message in the common database (Figure 7 functional block (77)). The Automation System then displays the message and may trigger an audible alert to notify the system operators that a new alarm has been received.

Figure 10 item (103) illustrates the process associated with the
 10 Customer Terminal (Figure 4 functional block (43)) polling the Burglar Alarm system. The Customer Terminal triggers an alarm test and checks for the response. A correct response to such a test is terminated by the Customer Terminal, while a missing response (not shown) is reported to the Agency Terminal in a manner similar to the reporting of an event from the alarm
 15 system.

Figure 10 item (104) details the polling process used by the Automation System to confirm the presence of the Agency Terminal (Figure 7 functional block (73)).

Figure 10 item (105) shows the messaging process involved with
 20 missed polls from the Agency Terminal to the Customer Terminal. In this process, the Agency Terminal (Figure 7 functional block (71)) polls the Customer Terminal (Figure 4 functional block (45)) every T-seconds. The Agency Terminal expects the Customer Terminal to respond to a poll request in under t-seconds where $t < T$. If the response is not received in under t-
 25 seconds, the Agency Terminal (Figure 7 functional block (72)) assumes that the response has been lost and re-polls the Customer Terminal (Figure 4 functional block (45)) a predetermined number of times, after which if no response has been received, an alarm is sent to the Automation System. This process ensures that the loss or malfunction of any Customer Terminal is
 30 identified within the polling interval.

Figure 11 illustrates the communication system messages associated with the Registration Server.

Figure 11 item (111) shows the messages that result when an Agency Terminal is added to the communications network. The Agency Terminal (Figure 7 functional block (76)) registers with the Registration Server (Figure 9 functional block (91)), in the process the Registration Server receives and stores the IP address of the registering Agency Terminal. The Registration Server returns an acknowledgment message to the Agency Terminal indicating that the registration process has been successfully completed.

Figure 11 item (112) describes the messages that are sent to the Registration Server when a Customer Terminal is started up. The Customer Terminal (Figure 4 functional block (45)) identifies itself to the Registration Server (Figure 9 functional block (92)), and provides information identifying the destination security company by, for example, providing the telephone number that the Burglar Alarm system dials and the Burglar Alarm system's preprogrammed account number. The Registration Server validates the identity of the Customer Terminal and returns the IP address of each of the associated Agency Terminals. These IP addresses are used by the Customer Terminal to communicate directly with the Agency Terminals.

Figure 11 item (113) shows the message flow following the registration process. Once registered, the Customer Terminal (Figure 4 functional block (45)) connects to the Agency Terminal (Figure 7 functional block (76)) using the IP address it has obtained from the Registration Server (Figure 9 functional block (92)). The Agency Terminal then proceeds to configure (Figure 7 functional block (76)) the Customer Terminal. Only after the Agency Terminal has completed the configuration of the Customer Terminal does the Agency Terminal start to poll it.

Figure 12 details the protocol stacks used in the embodiment of the invention that uses ADSL as the connection means to the broadband network from the Customer Terminal. Item (121) shows the protocol stack implementation in the Burglar Alarm system (prior art). Automated announcements from the Burglar Alarm system are sent in known formats using voice frequency signals to be sent out over the telephone land line connection. The Customer Terminal (Figure 4 functional block (43))

implements a protocol stack (122) that is complementary to that in the Burglar Alarm System. This protocol stack (122) is used by the Customer Terminal to decode the messages from the Burglar Alarm System. The decoded messages are re-coded by the Customer Terminal (Figure 4 functional block (45)) protocol stack (123) for transmission over the broadband network. The message structure used is shown in Figure 15 and is carried as a UDP message using the existing Internet Protocol (IP) which carries the source and destination addresses for the messages.

Figure 12 item (124) is the protocol stack used at the Agency Terminal (Figure 7 functional block (74)) to decode the messages from the Customer Terminal (Figure 4 functional block (45)). The decoded messages are put through the Agency Terminal (Figure 7 functional block (73)) protocol stack (125) for delivery to the Automation System for operator display. The reception of the event message by the Agency Terminal from the Customer Terminal is acknowledged by the Agency Terminal to the sending Customer Terminal by the Agency terminal sending the acknowledge message shown in Figure 15.

The contents of the alarm/event messages and their corresponding acknowledgment messages are encrypted for added security.

Figure 14 shows the message format used for poll requests and poll responses. Poll requests are sent by the Agency Terminal (Figure 7 functional block (71)) as UDP messages using the Internet Protocol, which includes the source and destination addresses of the message. The poll request is terminated on the Customer Terminal (Figure 4 functional block (45)) which responds by sending the poll response message shown in Figure 14, also sent as a UDP message using the Internet Protocol, which includes the source and destination addresses of the message. The poll response message is terminated by the Agency Terminal (Figure 7 functional block (72)) that has sent the poll request.

Figure 13 details the protocol stacks used in the embodiment of the invention that uses IP-based cellular telephony means such as GPRS or 1xRTT as the connection means to the broadband network from the Customer

Terminal. The message path is similar to that outlined above for ADSL.

The claims defining the invention are as follows:-

1. A telemetry system including:-

one or more supervision terminals;

5 one or more remote terminals associated with at least one of the supervision terminals;

a data network linking the supervision terminal and the remote terminal;

wherein;

10 the or each supervision terminal is in communication with each corresponding associated remote terminal across the data network without the intervention of an intermediate agency.

2. A system as claimed in claim 1, wherein

the or each remote terminal communicates with its associated supervision terminal or terminals using a predetermined communication protocol.

15

3. A system as claimed in claim 2, wherein

the data network uses the TCP/IP protocol suite.

4. A system as claimed in any one of the preceding claims, wherein

20 the data network is a broadband network.

5. A system as claimed in any one of the preceding claims, wherein

the remote terminal is linked to the network via an ADSL link.

6. A system as claimed in any one of the preceding claims, wherein the remote terminal is linked to the network via a wireless link

7. A system as claimed in claim 6, wherein
5 the wireless link is a cellular network link.

8. A system as claimed in claim 6, wherein the wireless link is a GPRS link.

10 9. A system as claimed in claim 6, wherein the wireless link is a 1xRTT link.

10. A system as claimed in any one of the preceding claims, wherein the supervision terminal is adapted to transmit poll requests to the or each remote terminal, and the or each remote terminal is adapted to transmit a poll
15 response to the supervision terminal on reception of a poll request.

11. A system as claimed in claim 10, wherein

the supervision terminal transmits poll requests at a poll request repetition rate, and wherein,

20 when no poll response is received from the remote terminal within a first window period in response to a poll request, the supervision terminal transmits a repeat poll requests after the first window period, the first window period being less than the poll request repetition period.

25 12. A system as claimed in any one of claims 10 or 11, wherein the request

poll includes selectable data

13. A system as claimed claim 12, wherein

the remote terminal includes response selection means to select a related
5 response message from the selectable information in the poll request.

14. A system as claimed in claim 13, wherein

the supervision terminal includes verification means to verify the related
response message from the remote terminal.

10

15. A system as claimed in any one of the preceding claims, wherein

the supervision terminal uses the poll response from the remote terminal to
verify integrity of the path between the remote terminal and the supervision
terminal.

15

16. A system as claimed in any one of the preceding claims, wherein

the remote terminal is adapted to transmit alarm messages independently of
the reception of a polling request from a supervision terminal.

20 17. A system as claimed in any one of claims 1 to 9, wherein

the remote terminal is adapted to transmit heartbeats to the or each
associated supervision terminal.

18. A system as claimed in any one of claims 1 to 9, wherein

25 the remote terminal is adapted to transmit heartbeats to the or each

associated supervision terminal as a response to a poll request from an associated supervision terminal.

19. A system as claimed in any one of the preceding claims, wherein

5 the remote terminal includes:

a bypass switch; and

remote terminal monitor means monitoring the remote terminal,

the remote terminal monitor means being adapted to operate the bypass switch to disconnect the remote terminal and to connect the alarm terminal to
10 a telephone network in the event of a failure of the remote terminal.

20. A system as claimed in any one of the preceding claims, wherein the remote terminal includes a telemetry interface adapted to emulate a network interface for the corresponding telemetry equipment and to convert
15 information received from the telemetry equipment to the network communication protocol.

21. A system as claimed in any one of the preceding claims, wherein

20 the or each supervision terminal is connected to an associated monitor system,

the monitor system being adapted to make information received from the supervision terminal available to an operator.

22. A system as claimed in claim 21, wherein

25 the supervision terminal includes monitor interface emulation means converting information from the supervision terminal to the monitor information

format.

23. A system as claimed in claim 21 or 22, wherein

the or each supervision terminal includes supervision terminal self-diagnostic
5 means and sends supervision terminal status reports to the associated
monitoring system.

24. A system as claimed in any one of claim 21 to 23, wherein

the or each remote terminal includes remote terminal self-diagnostic means
10 and sends remote terminal status reports to the associated monitoring
system.

25. A system as claimed in any one of the preceding claims, including

an association register recording the association between remote terminals
15 and supervision terminals.

26. A system as claimed in any one of the preceding claims, wherein

for at least one supervision terminal, there is an additional supervision
terminal to provide redundancy.

20

27. A system as claimed in claim 26, wherein

the association register is located in a registration server, and

the address of the registration server is installed in remote terminal to enable
the remote terminal to communicate with the registration server whenever the
25 remote terminal is powered up.

28. A method of transmitting information in a telemetry system including:-

one or more supervision terminals;

5 one or more remote terminals associated with at least one of the supervision terminals;

a data network linking the supervision terminal and the remote terminal;

the method including the step of:

10 monitoring the or each remote terminal from at least one of the associated supervision terminals via the data network without the intervention of an intermediate agency.

29. A method as claimed in claim 27, wherein

the or each remote terminal communicates with its associated supervision terminal or terminals using a predetermined communication protocol.

15 30. A method as claimed in claim 29, wherein

the data network uses the TCP/IP protocol suite.

31. A method as claimed in any one of claims 28 to 30, wherein

the data network is a broadband network.

20

32. A method as claimed in any one of the claims 28 to 32, wherein

the network is an ADSL network.

33. A method as claimed in any one of claims 28 to 32, wherein

the supervision terminal transmits poll requests to the or each remote terminal, and the or each remote terminal transmits a poll response to the supervision terminal on reception of a poll request.

- 5 34. A method as claimed in claim 33, wherein
- the supervision terminal transmits poll requests at a poll request repetition rate, and wherein,
- when no poll response is received from the remote terminal within a first window period in response to a poll request, the supervision terminal
- 10 transmits a repeat poll requests after the first window period, the first window period being less than the poll request repetition period.

- 35a. A method as claimed in claim 34, wherein, in the event of a predetermined number of sequential failures of a poll response from a remote
- 15 terminal, the supervision terminal transmits a failure notification to the monitor system.

35. A method as claimed in any one of claims 33 or 34, including
- at the supervision terminal, transmitting a poll request containing selectable
- 20 information.

36. A method as claimed claim 35, the method including,
- at the remote terminal, selecting related response information based on the selectable information in the poll request.

25

37. A method as claimed in any one of claims 28 to 36, including,

at the supervision terminal, verifying integrity of the path between the remote terminal and the supervision terminal from the related response information in the poll response.

5 38. A method as claimed in any one of claims 28 to 37, including,

at the remote terminal, transmitting alarm messages independently of the reception of a polling request from a supervision terminal.

39. A method as claimed in any one of claims 28 to 32, including,

10 at the remote terminal, autonomously transmitting heartbeats to the or each associated supervision terminal.

40. A method as claimed in any one of claims 28 to 32, including,

15 at the remote terminal, transmitting heartbeats to the or each associated supervision terminal as a response to a poll request from an associated supervision terminal.

41. A method as claimed in any one of claims 28 to 40, wherein the remote terminal transmits association information to an association register on start-

20 up of the remote terminal.

42. A method as claimed in claim 41, wherein the remote terminal retrieves information from the associated telemetry terminal for transmission to the association register.

25

43. A method as claimed in any one of claims 28 to 41, wherein the remote

terminal includes

bypass switch means and

remote terminal monitor means monitoring the remote terminal, wherein

the remote terminal monitor means operates the bypass switch means to
5 disconnect the data link and connects the telemetry terminal to the telephone
line in the event of a failure of the remote terminal.

44. A method as claimed in any one of claims 28 to 43, wherein

the remote terminal includes a telemetry interface,

10 the method including:

at the telemetry interface, emulating a network interface for the corresponding
telemetry equipment,

converting information received from the telemetry equipment to the network
communication protocol, and

15 transmitting the converted information to the supervision terminal.

45. A method as claimed in any one of claims 28 to 44, wherein

the or each supervision terminal is connected to an associated monitor
system,

20 the method including:

presenting information received from the supervision terminal to an operator
at the monitor system.

46. A system as claimed in claim 45, wherein

25 the supervision terminal includes monitor interface emulation means,

the method including:

at the supervision terminal, converting information for transmission to the monitor system from the supervision terminal to the monitor information format.

5

47. A method as claimed in any one of claims 28 to 46, wherein supervision terminal includes supervising terminal monitor means, the method including,

10 at the supervision terminal, monitoring the status of the supervision terminal, and transmitting supervision terminal status reports to the monitor system.

48. A method as claimed in any one of claims 28 to 47, wherein remote terminal includes remote terminal monitor means, 15 the method including, at the remote terminal, monitoring the status of the remote terminal, and transmitting remote terminal status reports to the monitor system.

49. A method as claimed in any one of claims 28 to 48, including 20 compiling a registration table associating the or each remote terminal with the or each associated supervision terminal.

49. A method as claimed in claim 49, including installing the address of the registration table in the or each remote terminal,

the remote terminal being programmed to communicate with the registration table on start up of the remote terminal.

50. A supervision terminal for use in a system as claimed in any one of claims 1 to 27, including:

5 a supervision terminal network interface means adapted to respond to an alert condition (poll response failure or event messages) originating from a remote terminal

monitor system interface adapted to transmit an alert message to the associated monitor system and to receive a first acknowledgment message
10 therefrom,

the supervision terminal network interface being adapted to transmit a second acknowledgment signal to the remote terminal from which the alert condition originated.

50a. A supervision terminal for use in a system as claimed in any one of
15 claims 1 to 27, the supervision terminal including:

a supervision terminal network interface including:

alert condition storage means,

alert condition processing means,

a monitor system interface including:

20 message means transmitting an alert condition originating from a remote terminal to the monitor system;

means for receiving and storing of a first acknowledgment message sent by the supervision system;

25 51. A supervision terminal as claimed in claim 50, wherein

the supervision terminal includes poll request transmission means to transmit poll requests to one or more associated remote terminals, the or each

associated remote terminal being adapted to transmit a poll response to the supervision terminal on reception of a poll request, and wherein

the supervision terminal including verification means to verify the related response message from the remote terminal.

5

52. A supervision terminal as claimed in claim 50 or 51, wherein

the supervision terminal transmits poll requests at a poll request repetition rate, and wherein,

10 when no poll response is received from the remote terminal within a first window period in response to a poll request, the supervision terminal transmits repeat poll requests after the first window period, the first window period being less than the poll request repetition period.

15 53. A supervision terminal as claimed in any one of claims 51 or 52, wherein the request poll includes selectable data

54. A supervision terminal as claimed in any one of claims 51 to 53, wherein

20 the supervision terminal uses the poll response from the remote terminal to verify integrity of the path between the remote terminal and the supervision terminal.

55. A supervision terminal as claimed in any one of claims 50 to 55, wherein

25 the or each supervision terminal is connected to an associated monitor system via said monitor interface.

56. A supervision terminal as claimed in claim 55, wherein
the monitor interface converts information from the supervision terminal to the
monitor information format.

5 57. A supervision terminal as claimed in claim 21 or 22, including
supervision terminal self-diagnostic means adapted to send supervision
terminal status reports to the associated monitoring system.

51. A remote terminal for use in a system as claimed in any one of claims 1
to 27, including:

10 A remote terminal network interface means adapted to:

Receive and respond to poll requests from an associated supervision
terminal;

transmit alert condition to an associated supervision terminal;

15 telemetry panel interface adapted to receive telemetry messages originating
from the associated telemetry panel, and to transmit third acknowledgment
messages to the telemetry panel.

58a A remote terminal as claimed in claim 58, wherein the third
acknowledgment message is transmitted in response to the reception of a
second acknowledgment message from an associated supervision terminal.

20 58b A remote terminal as claimed in claim 58 including tamper detection
means whereby the Customer Terminal is able to continuously monitor the
telemetry terminal to detect tampering or substitution attempts;

59. A remote terminal as claimed claim 58, including
response selection means to select a related response message from
25 selectable information in a poll request from an associated supervision
terminal.

60. A remote terminal as claimed in claim 58 or 59, wherein

the remote terminal is adapted to transmit alarm messages independently of the reception of a polling request from a supervision terminal.

5 61. A remote terminal as claimed in any one of claims 58 to 60, wherein

the remote terminal is adapted to transmit heartbeats to the or each associated supervision terminal.

62. A remote terminal as claimed in any one of claims 58 to 60, wherein

10 the remote terminal is adapted to transmit heartbeats to the or each associated supervision terminal as a response to a poll request from an associated supervision terminal.

63. A remote terminal as claimed in any one of claims 58 to 62, including:

15 a bypass switch; and

remote terminal monitor means monitoring the remote terminal,

the remote terminal monitor means being adapted to operate the bypass switch to disconnect the remote terminal and to connect an associated telemetry terminal to a telephone network in the event of a failure of the
20 remote terminal.

64. A remote terminal as claimed in any one claims 58 to 63, including

a telemetry interface adapted to emulate a network interface for the corresponding telemetry equipment and to convert information received from
25 the telemetry equipment to the network communication protocol.

65. A remote terminal as claimed in any one of claims 58 to 64, including remote terminal self-diagnostic means whereby, the remote terminal sends remote terminal status reports to an associated monitoring system.

5 66. A remote terminal as claimed in any one of claims 58 to 65, wherein the address of one or more association registers is recorded in the remote terminal to enable the remote terminal to communicate with the registration server whenever the remote terminal is powered up..

10 67. A remote terminal as claimed in any one of claims 58 to 66, wherein the remote terminal is associated with at least one additional supervision terminal to provide redundancy.

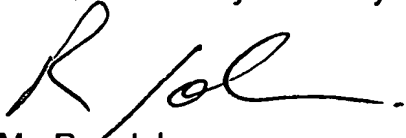
15 68. A telemetry system substantially as herein described with reference to the accompanying drawings.

69. A method of transmitting information in a telemetry system substantially as herein described with reference to the accompanying drawings.

20 70. A supervision terminal substantially as herein described with reference to the accompanying drawings.

71. A remote terminal substantially as herein described with reference to the accompanying drawings.

Dated this twenty-sixth day of July 2002

A handwritten signature in black ink, appearing to read 'R. Johan', with a long horizontal stroke extending to the right.

Mr. Ron Johan

Managing Director

5 UHS Systems Pty. Ltd.

ACN 094 972 684

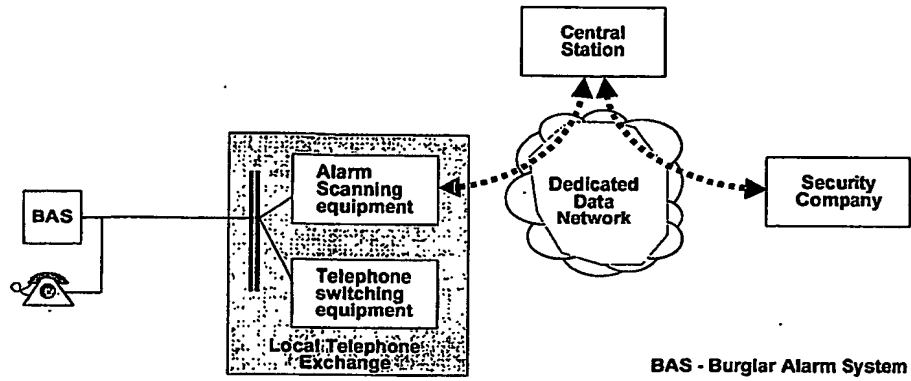


Figure 1: Derived Channel Monitoring System

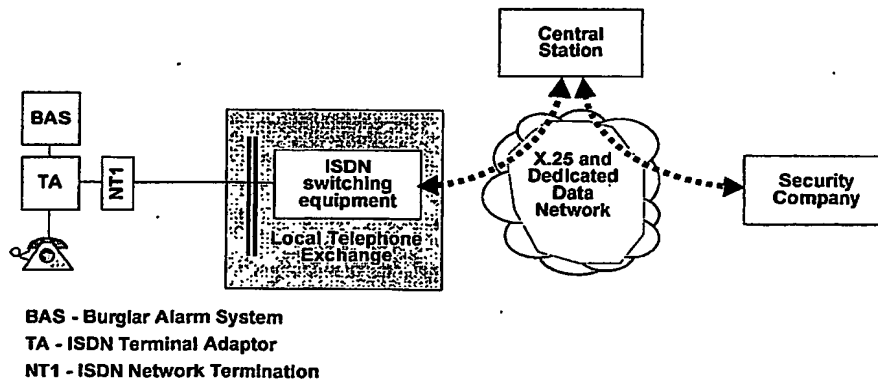


Figure 2: ISDN Monitoring System

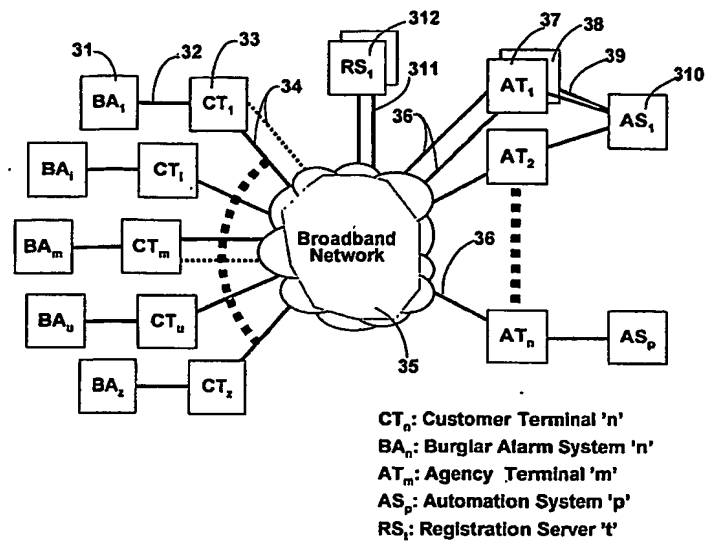


Figure 3

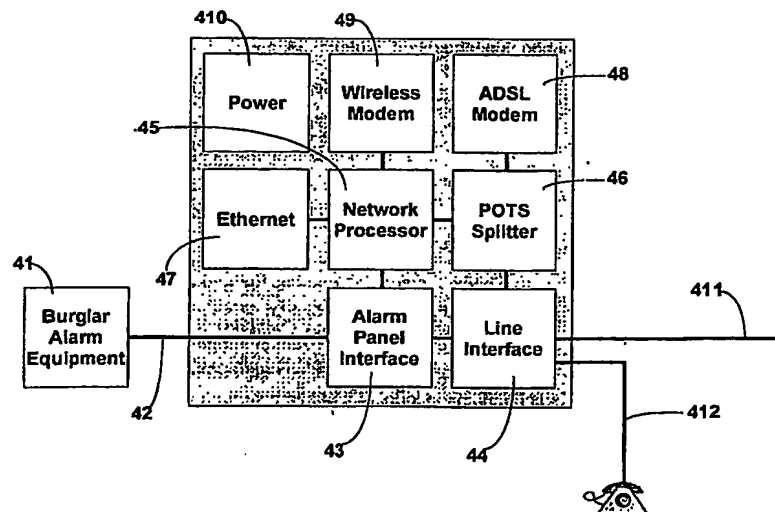


Figure 4

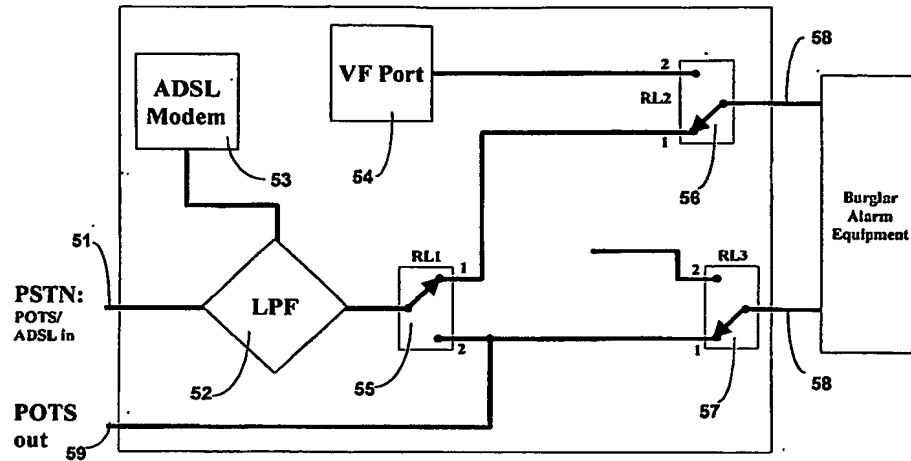


Figure 5

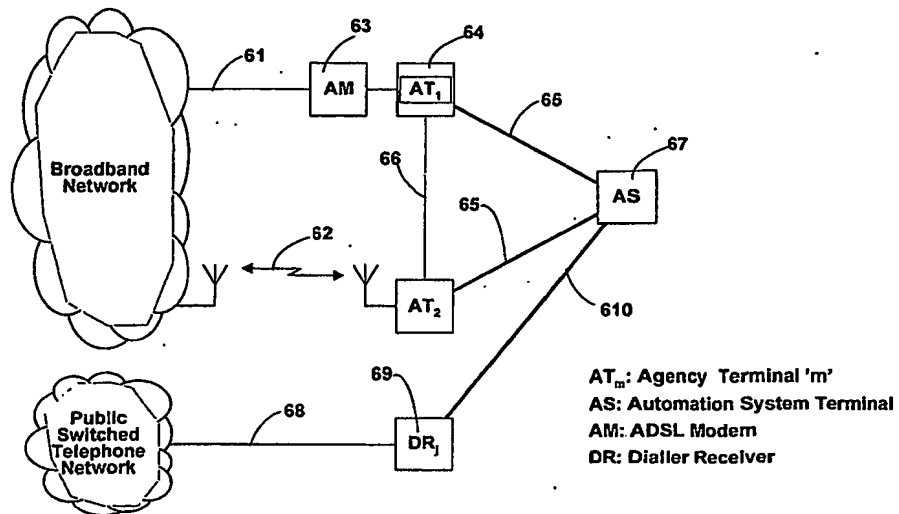


Figure 6

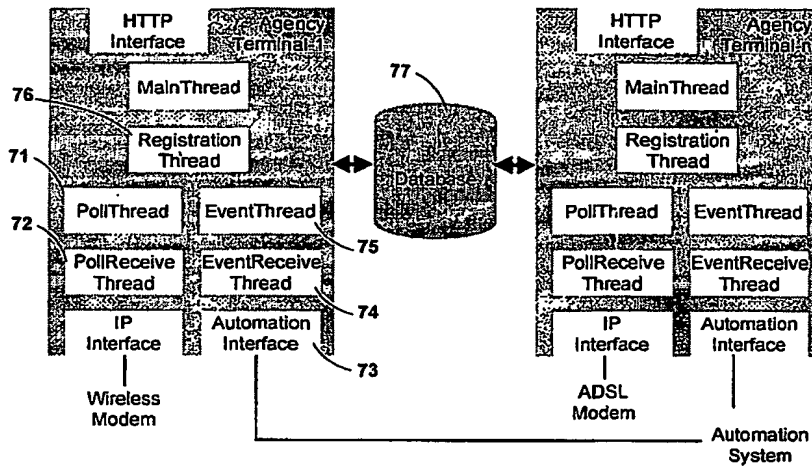


Figure 7: Agency Terminal Schematic

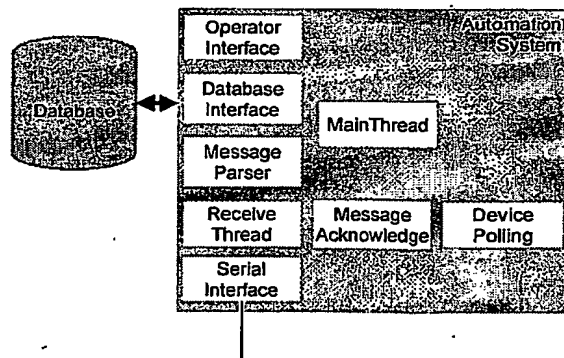


Figure 8: Automation System Schematic

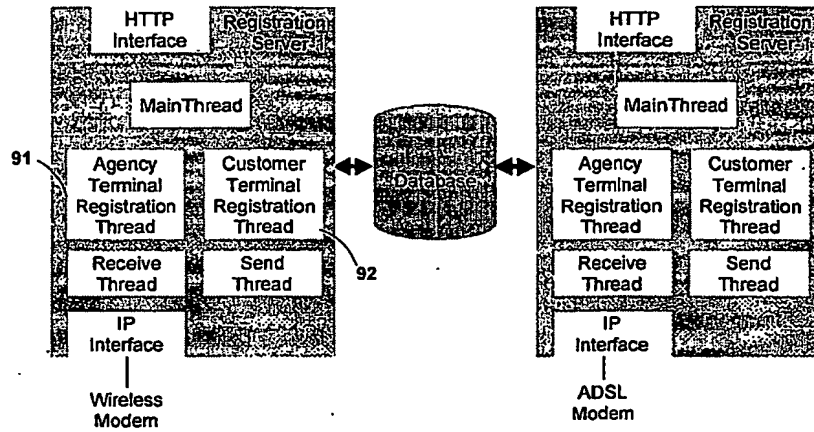


Figure 9: Registration Server Schematic

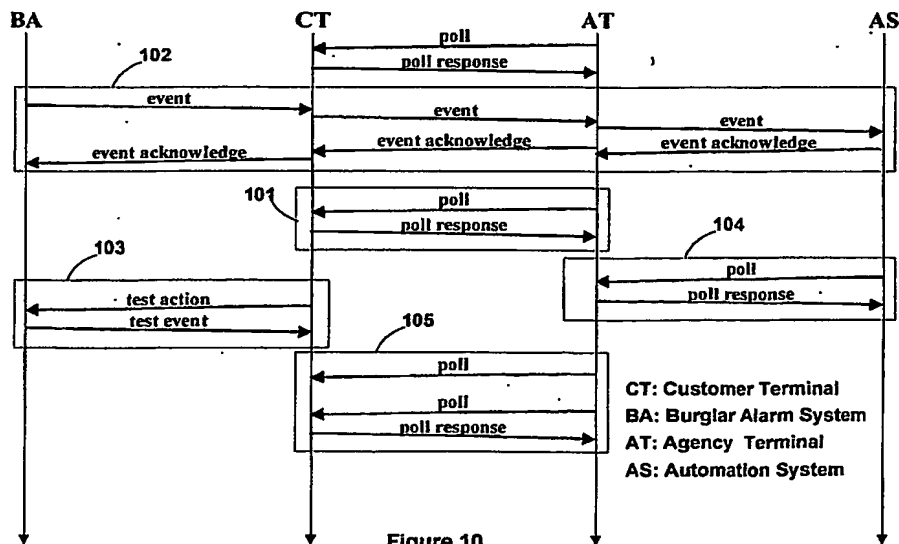


Figure 10

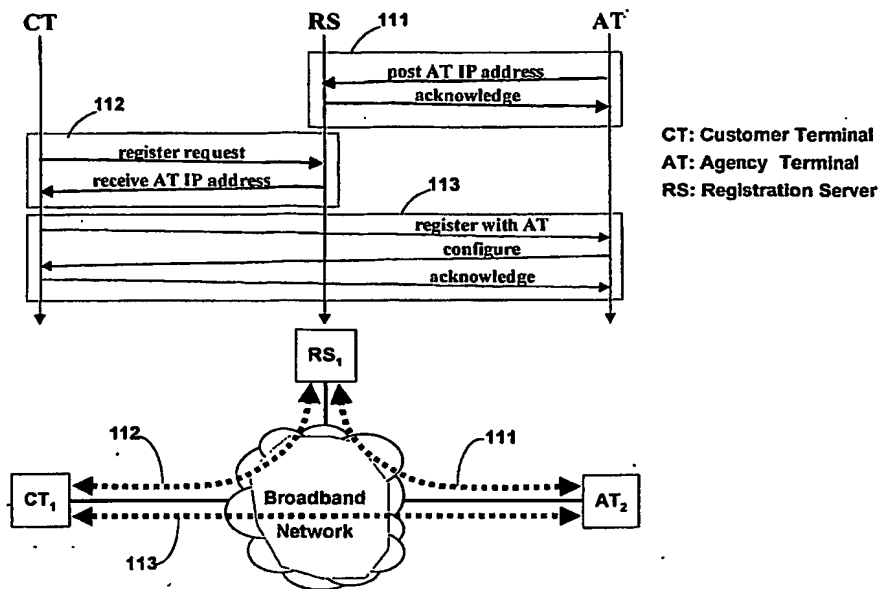
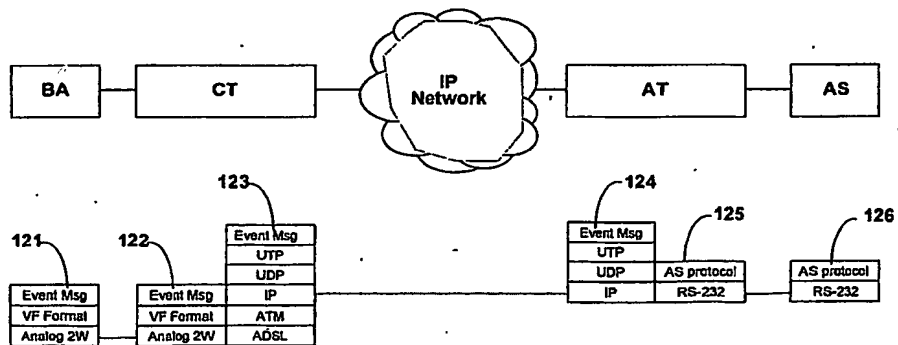


Figure 11



CT: Customer Terminal
BA: Burglar Alarm System
AT: Agency Terminal
AS: Automation System

Figure 12

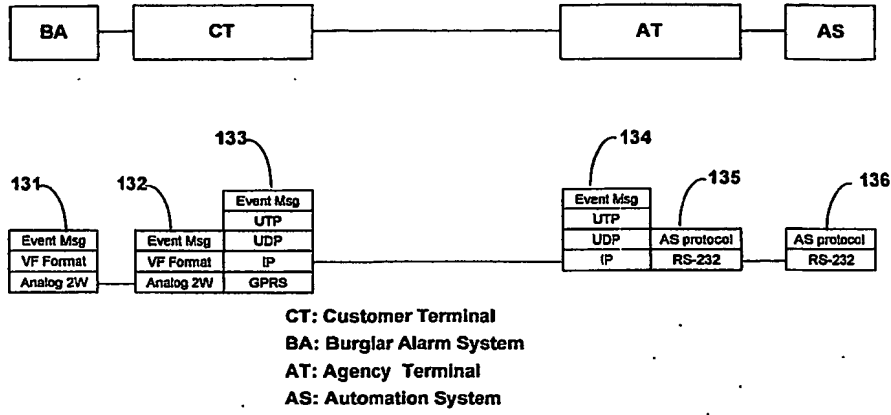


Figure 13

type	ID num
8 BITS	32 BITS

Poll Message from Agency Terminal to Customer Terminal

type	ID num
8 BITS	32 BITS

Poll Response Message from Customer Terminal to Agency Terminal

Figure 14

type	length	ID num	timestamp	information	crc
8 BITS	16 BITS	32 BITS	DRMS (24 BITS)	UP TO 100 BYTES	2 BYTES

Event/Alarm notification Message from Customer Terminal to Agency Terminal

type	length	ID num	information	crc
8 BITS	16 BITS	32 BITS	UP TO 100 BYTES	2 BYTES

Acknowledge Message from Agency Terminal to Customer Terminal

Figure 15